ABSTRACT OF THE DISCLOSURE

Solid battery components are provided. A block copolymeric electrolyte is non-crosslinked and non-glassy through the entire range of typical battery service temperatures, that is, through the entire range of at least from about 0°C to about 70°C. The chains of which the copolymer is made each include at least one ionically-conductive block and at least one second block immiscible with the ionically-conductive block. The chains form an amorphous association and are arranged in an ordered nanostructure including a continuous matrix of amorphous ionically-conductive domains and amorphous second domains that are immiscible with the ionically-conductive domains. A compound is provided that has a formula of $Li_xM_yN_zO_2$. M and N are each metal atoms or a main group elements, and x, y and z are each numbers from about 0 to about 1. y and z are chosen such that a formal charge on the M_yN_z portion of the compound is (4-x). In certain embodiments, these compounds are used in the cathodes of rechargeable batteries. The present invention also includes methods of predicting the potential utility of metal dichalgogenide compounds for use in lithium intercalation compounds. It also provides methods for processing lithium intercalation oxides with the structure and compositional homogeneity necessary to realize the increased formation energies of said compounds. An article is made of a dimensionally-stable, interpenetrating microstructure of a first phase including a first component and a second phase, immiscible with the first phase, including a second component. The first and second phases define interphase boundaries between them, and at least one particle is positioned between a first phase and a second phase at an interphase boundary. When the first and second phases are electronically-conductive and ionically-conductive polymers, respectively, and the particles are ion host particles, the arrangement is an electrode of a battery.